

Amendments to the Claims

1. (Withdrawn) A method of three-dimensional printing, comprising:
  - providing a first layer of free-flowing particulate material comprising an ionic reactant;
  - dispensing a homogeneous fluid onto a first region of the first layer, the fluid comprising an ionic reactant and the first region being contiguous with a second region comprising the free-flowing particulate material;
  - allowing an ion exchange reaction to occur between the particulate reactant and the reactant in the fluid, the reaction causing a solidified material to form in the first region;
  - providing a second layer of the particulate material over the first layer; and
  - dispensing the fluid onto a first region of the second layer.
2. (Withdrawn) The method of claim 1, wherein the reactant in the fluid is an electrolyte.
3. (Withdrawn) The method of claim 2, wherein the electrolyte is a polyelectrolyte.
4. (Withdrawn) The method of claim 3, wherein the polyelectrolyte is a cationic polyelectrolyte.
5. (Withdrawn) The method of claim 4, wherein the cationic polyelectrolyte is selected from the group consisting of polyallylamine hydrochloride, polybutylaminoethyl methacrylate, polyethyleneimine, polyvinyl pyridine and poly diallyldimethylammonium chloride.
6. (Withdrawn) The method of claim 3, wherein the polyelectrolyte is an anionic polyelectrolyte.
7. (Withdrawn) The method of claim 6, wherein the anionic polyelectrolyte is selected from the group consisting of sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid,

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ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid and copolymer of sodium styrene sulfonate with maleic anhydride.

8. (Withdrawn) The method of claim 6, wherein the particulate ionic reactant is a cationic reactant.
9. (Withdrawn) The method of claim 8, wherein the cationic reactant is selected from the group consisting of Empresol N, Unicat KC1420, Unicat C3T, PENCAT 600, APOLLO 4280, polyallylamine hydrochloride, polybutylaminoethyl methacrylate, polyethyleneimine, polyvinyl pyridine, poly diallyldimethylammonium chloride, aminosilane-functionalized glass beads.
10. (Withdrawn) The method of claim 4, wherein the particulate ionic reactant is an anionic reactant.
11. (Withdrawn) The method of claim 10, wherein the anionic reactant is selected from the group consisting of Astro-gum 3010, Astro-gum 21, sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid, ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid and copolymer of sodium styrene sulfonate with maleic anhydride.
12. (Cancelled)
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21. (Withdrawn) A method of three-dimensional printing, comprising:

providing a first layer of a free-flowing particulate material comprising a reactant selected from the group consisting of metals, minerals and ceramic oxides;

dispensing a homogeneous fluid onto a first region of the first layer, the fluid comprising a reactant and the first region being contiguous with a second region comprising the free-flowing particulate material;

allowing a reaction to occur between the particulate reactant and the reactant in the fluid, the reaction causing a solidified material to form in the first region;

providing a second layer of the particulate material over the first layer; and

dispensing the fluid onto a first region of the second layer.

22. (Withdrawn) The method of claim 21, wherein the reactant in the fluid is a polymer capable of solidification.

23. (Withdrawn) The method of claim 22, wherein the solidification occurs by ionic bonding.

24. (Withdrawn) The method of claim 22, wherein the solidification occurs by hydrogen bonding.

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25. (Withdrawn) The method of claim 22, wherein the solidification occurs by cross-linking.
26. (Withdrawn) The method of claim 22, wherein the reactant is selected from the group consisting of sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid, ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid and copolymer of sodium styrene sulfonate with maleic anhydride.
27. (Withdrawn) The method of claim 21, wherein the reactant is a metal selected from the group consisting of iron, copper, carbon steel, stainless steel, aluminum, brass, molybdenum, tungsten, magnesium, and cobalt.
28. (Withdrawn) The method of claim 21, wherein the reactant is a ceramic oxide selected from the group consisting of alumina ( $\text{Al}_2\text{O}_3$ ), anatase ( $\text{TiO}_2$ ), silicon dioxide, aluminum silicate and glass.
29. (Withdrawn) The method of claim 21, wherein the reactant is a mineral selected from the group consisting of limestone ( $\text{CaCO}_3$ ), magnetite, calcium silicate ( $\text{CaSiO}_4$ ), hydrous calcium sulfate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ), hydrated lime ( $\text{Ca}(\text{OH})_2$ ) and calcium phosphate.
30. (Withdrawn) A method of three-dimensional printing, comprising:
- providing a first layer of a free-flowing particulate material comprising a particles having a reactive surface;
  - dispensing a fluid onto a first region of the first layer, the fluid comprising a reactant and the first region being contiguous with a second region comprising the free-flowing particulate material;
  - allowing a reaction to occur between the reactive polymer and the reactant in the fluid,

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the reaction causing a solidified material to form in the first region;  
providing a second layer of the particulate material over the first layer; and  
dispensing the fluid onto a first region of the second layer.

31. (Withdrawn) The method of claim 30, wherein the reactant in the fluid is a monomer and the particulate material further comprises an initiator.

32. (Withdrawn) The method of claim 31, wherein the monomer is selected from the group consisting of a vinylic monomer, an acrylic monomer and a dienic monomer.

33. (Withdrawn) The method of claim 32, wherein the monomer is selected from the group consisting of acrylic acid, methacrylic acid, acrylamide and styrene.

34. (Withdrawn) The method of claim 31, wherein the reactive polymer is selected from the group consisting of an unsaturated polyester, polybutadiene, polyisoprene, an unsaturated polyurethane and copolymers thereof.

35. (Withdrawn) The method of claim 31, wherein the initiator is selected from the group consisting of potassium persulfate, ammonium persulfate, sulfuric acid, perchloric acid, fluorosulfonic acid, trifluoromethylsulfonic acid, trifluoroacetic acid, tin tetrachloride, aluminum trichloride, and boron trifluoride, potassium peroxodisulfate, ammonium persulfate with N,N,N',N'-tetramethylethylenediamine (TMEDA), 3-dimethylaminopropionitrile (DMAPN, potassium persulfate with 4,4-azobis(4-cyanovaleric acid), dibenzoyl peroxide, t-butyl perbenzoate and azobisisobutyronitrile.

36. (Withdrawn) The method of claim 30, wherein the particulate material comprising a reactive polymer includes inert particles having a reactive coating.

37. (Withdrawn) The method of claim 30, wherein the reactive coating is a polyol group.

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38. (Withdrawn) The method of claim 37, wherein the reactant in the fluid is an isocyanate.
39. (Withdrawn) The method of claim 38, wherein the isocyanate is Bayhydur XP-7063.
40. (Withdrawn) The method of claim 36, wherein the reactive coating comprises sodium polystyrene sulfonate, sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid, ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid and copolymer of sodium styrene sulfonate with maleic anhydride.
41. (Withdrawn) The method of claim 40, wherein the reactant in the fluid is a cationic polyelectrolyte.
42. (Withdrawn) The method of claim 41, wherein the cationic polyelectrolyte is selected from the group consisting of polyallylamine hydrochloride, polybutylaminoethyl methacrylate, polyethyleneimine, polyvinyl pyridine and poly diallyldimethylammonium chloride.
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54. (Cancelled)

55. (Withdrawn) A method of three-dimensional printing, comprising:  
    providing a first layer of a free-flowing particulate material comprising a reactant;  
    dispensing a fluid onto a first region of the first layer, the fluid comprising a reactant and  
the first region being contiguous with a second region comprising the free-flowing particulate  
material;  
    allowing a reaction to occur between the particulate reactant and the reactant to form an  
adhesive, the reaction causing a solidified material to form in the first region;  
    providing a second layer of the particulate material over the first layer; and  
    dispensing the fluid onto a first region of the second layer.

56. (Withdrawn) The method of claim 55, wherein particulate reactant is a copolymer of  
octacrylamide/acrylates/butylaminoethylmethacrylate.

57. (Withdrawn) The method of claim 56, wherein the reactant in the fluid is selected from the  
group consisting of 2-amino-2-methyl 1-propanol (AMP), polyethyleneimine 2-amino-2-methyl

1-3 propanediol (AMPD), 2-amino-2-ethyl 1-3-propanediol (AEPD), and a hydroxide.

58. (Withdrawn) The method of claim 57, wherein the hydroxide is selected from the group consisting of sodium hydroxide, potassium hydroxide, and ammonium hydroxide.

59. (Withdrawn) The method of claim 55, wherein the particulate reactant is selected from the group consisting of sodium carbonate and potassium aluminum sulfate.

60. (Withdrawn) The method of claim 59, wherein the reactant in the fluid is formaldehyde.

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73. (Withdrawn) A method of three-dimensional printing, comprising:

- providing a first layer of a free-flowing particulate material comprising an adhesive;
- dispensing a first fluid onto the first layer to dissolve the adhesive;
- dispensing a fluid solidifying agent onto a first region of the first layer and the first region being contiguous with a second region comprising the free-flowing particulate material;
- allowing a reaction to occur between the first fluid and the solidifying agent, the reaction causing a solidified material to form in the first region;
- providing a second layer of the particulate material over the first layer; and
- dispensing the fluid onto a first region of the second layer.

74. (Withdrawn) The method of claim 73, wherein the particulate adhesive is octacrylamide/acrylates/butylaminoethylmethacrylate copolymer.

75. (Withdrawn) The method of claim 74, wherein the first fluid is selected from the group consisting of 2-amino-2-methyl 1-propanol (AMP), 2-amino-2-methyl 1-3 propanediol (AMPD), 2-amino-2-ethyl 1-3-propanediol (AEPD), sodium hydroxide, potassium hydroxide, and ammonium hydroxide.

76. (Withdrawn) The method of claim 75, wherein the solidifying agent is an acid.

77. (Withdrawn) The method of claim 76, wherein the acid is selected from the group consisting of hydrochloric acid, citric acid, succinic acid, adipic acid, polyacrylic acid, polymethacrylic acid, and polyvinyl sulfonic acid.

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83. (Cancelled)

84. (Cancelled)

85. (Currently amended) A method of three-dimensional printing, comprising:

providing a first layer of a free-flowing particulate material comprising a first reactant and a second reactant;

dispensing a fluid onto a first region of the first layer and the first region being contiguous with a second region comprising the free-flowing particulate material;

allowing a reaction between the first and second reactants to occur, the reaction causing a solidified material to form in the first region;

providing a second layer of the particulate material over the first layer; and  
dispensing the fluid onto a first region of the second layer.

86. (Original) The method of claim 85, wherein at least one of the first and second reactants is soluble in the fluid.

87. (Original) The method of claim 86, wherein the first and second reactants are ionic reactants.

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88. (Original) The method of claim 87, wherein the first reactant is an electrolyte.
89. (Original) The method of claim 88, wherein the first reactant is a polyelectrolyte.
90. (Original) The method of claim 89, wherein the first reactant is a cationic polyelectrolyte.
91. (Original) The method of claim 90, wherein the cationic polyelectrolyte is selected from the group consisting of polyallylamine hydrochloride, polybutylaminoethyl methacrylate, polyethyleneimine, polyvinyl pyridine and poly diallyldimethylammonium chloride.
92. (Original) The method of claim 89, wherein the first reactant is an anionic polyelectrolyte.
93. (Previously presented) The method of claim 92, wherein the anionic polyelectrolyte is selected from the group consisting of sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid, ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid, copolymer of sodium styrene sulfonate with maleic anhydride and polyvinyl pyridine.
94. (Original) The method of claim 92, wherein the second reactant is a cationic reactant.
95. (Currently amended) The method of claim 94, wherein the cationic reactant is selected from the group consisting of ~~Empresol N, Unicat KC1420, Unicat C3T, PENCAT 600, APOLLO 4280~~, polyallylamine hydrochloride, polybutylaminoethyl methacrylate, polyethyleneimine, polyvinyl pyridine, poly diallyldimethylammonium chloride, aminosilane-functionalized glass beads.

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96. (Original) The method of claim 90, wherein the second reactant is an anionic reactant.
97. (Currently amended) The method of claim 96, wherein the anionic reactant is selected from the group consisting of ~~Astro-gum 3010, Astro-gum 21~~, sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid, ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid and copolymer of sodium styrene sulfonate with maleic anhydride.
98. (Original) The method of claim 87, wherein the reaction is an ion exchange reaction.
99. (Withdrawn) The method of claim 85, wherein the first reactant is selected from the group consisting of metals, salts and ceramic oxides.
100. (Withdrawn) The method of claim 99, wherein the fluid is an acid.
101. (Withdrawn) The method of claim 100, wherein the acid is selected from the group consisting of acetic acid and hydrochloric acid.
102. (Withdrawn) The method of claim 100, wherein the second reactant is selected from the group consisting of a polymeric acid, sulfonated polystyrene, polyacrylic acid, polymethacrylic acid, polyvinyl sulfonic acid, alkali metal salts of polyacrylic acid, alkali metal salts of polymethacrylic acid, alkali metal salts of polyvinyl sulfonic acid, ammonium salt of polyvinyl sulfonic acid, ammonium salt of sulfonated polystyrene, ammonium salt of polyacrylic acid, ammonium salt of polymethacrylic acid and copolymer of sodium styrene sulfonate with maleic anhydride.
103. (Withdrawn) The method of claim 102, wherein the metal is selected from the group

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consisting of iron, copper, carbon steel, stainless steel, aluminum, brass, molybdenum, tungsten, magnesium, and cobalt.

104. (Withdrawn) The method of claim 99, wherein the ceramic oxide is selected from the group consisting of alumina ( $\text{Al}_2\text{O}_3$ ), anatase ( $\text{TiO}_2$ ), silicon dioxide, aluminum silicate and glass.

105. (Withdrawn) The method of claim 99, wherein the mineral is selected from the group consisting of limestone ( $\text{CaCO}_3$ ), magnetite, calcium silicate ( $\text{CaSiO}_4$ ), hydrous calcium sulfate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ), hydrated lime ( $\text{Ca}(\text{OH})_2$ ) and calcium phosphate.

106. (Cancelled)

107. (Cancelled)

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110. (Cancelled)

111. (Cancelled)

112. (Withdrawn) The method of claim 1, wherein the particulate material comprises a mixture of inert particles and the particulate reactant.

113. (Cancelled)

114. (Cancelled)

115. (Withdrawn) The method of claim 112, wherein the inert particle is selected from the group consisting of a polymer, a ceramic, a metal, an organic material, an inorganic material, a mineral, clay and a salt.

116. (Withdrawn) The method of claim 115, wherein the polymer is selected from the group consisting of poly(methyl methacrylate), polystyrene, polyamide, polyester, a latex, polyethylene, polypropylene, polyurethane, polyvinyl chloride, polyvinyl acetate, cross-linked polyvinyl pyrrolidone, hydrophilic polyurethane, poly(ethylene terephthalate), thermoplastic urethane, styrene-acrylonitrile copolymer, thermoplastic polyolefin, an epoxy-based polymer, polyether, polyamine, a polyacid, a polycarbonate, a vinyl polymer, an aromatic polyamide, a diene polymer, poly(phenylene oxide), polysiloxane, polynorbornene, polyisoprene, a polyphenylene ether, styrene-butadiene block copolymer, acrylonitrile-butadiene-styrene, high impact polystyrene and copolymers thereof.

117. (Withdrawn) The method of claim 115, wherein the ceramic is selected from the group consisting of gypsum, limestone, clay, aluminum oxide, aluminum silicate, calcium silicate, silicon dioxide, titanium dioxide, glass, iron oxide, zinc oxide, magnetite, aluminum hydroxide, magnesium oxide, calcium phosphate, zirconium silicate, silicon carbide, boron nitride, boron carbide and borosilicate.

118. (Withdrawn) The method of claim 115, wherein the organic material is selected from the group consisting of starch, cellulose, wood powder, wax, resin, bone, protein, carbohydrates, sugars, textile fibers and dietary fibers.

119. (Withdrawn) The method of claim 115, wherein the salt is selected from the group of sodium silicate, sodium carbonate, sodium bicarbonate, sodium borate, sodium chloride, sodium sulfate, potassium sulfate, potassium chloride, magnesium sulfate, magnesium chloride, potassium aluminum sulfate, sodium polyphosphate and sodium acetate, hydrous calcium

sulfate, calcium phosphate, sodium silicate, and hydrated lime ( $\text{Ca}(\text{OH})_2$ ).

120. (Withdrawn) The method claim 21, wherein the particulate material comprises a mixture of inert particles and the particulate reactant.

121. (Withdrawn) The method claim 30, wherein the particulate material comprises a mixture of inert particles and the particulate reactant.

122. (Withdrawn) The method claim 55, wherein the particulate material comprises a mixture of inert particles and the particulate reactant.

123. (Withdrawn) The method claim 73, wherein the particulate material comprises a mixture of inert particles and the particulate reactant.

124. (Previously presented) The method claim 85, wherein the particulate material comprises a mixture of inert particles and the particulate reactant.

125. (New) The method of claim 94, wherein the cationic reactant is as cationically reactant starch.

126. (New) The method of claim 94, wherein the cationic reactant is an anionically reactant starch.